DRAFT

STAFF PROPOSED OZONE AND PM10 LOCAL MITIGATION FOR EAST ALTAMONT ENERGY CENTER

The project

The proposed East Altamont Energy Center (EAEC) is a nominal 1,100 megawatt natural gas-fired, combined-cycle power plant comprised of three combustion turbines, three large duct burners, one steam turbine, and supporting equipment. The project emissions are proposed to be limited to 148 tons per year (TPY) of particulate matter (PM_{10}), 74 TPY of organic compounds (VOC), and 263 TPY of oxides of nitrogen (NO_x).

The Problem

The project site area experiences numerous violations of the state ozone and PM_{10} ambient air quality standards. This, with the project's emissions, could create significant adverse impacts. Staff is investigating all feasible mitigation methods to lessen the power plant impacts.

From 1992 to 2000, the area experienced 5 to 22 days a year of violations of the state 1-hour ozone standard, and there is no clear trend or indication that the ozone air quality will improve.

From 1992 through 2000, the data show that PM_{10} violations occurred primarily between the months of October through January when the weather is cold. The area PM_{10} violations are typically caused by wood smoke, combustion of fossil fuels, and entrained dust from motor vehicles and construction activities (Bay Area 2000 Clean Air Plan). The area experienced the highest level of $PM_{2.5}$ concentrations of all the counties in the Bay Area District air basin.

While the applicant has provided emission reduction credits (ERCs) sufficient to satisfy the Bay Area Air Quality Management District (District) rules and regulations (see District Preliminary Determination of Compliance (PDOC)), the ERCs do not, in staff's opinion, fully mitigate the project PM_{10} and ozone impacts to the local area due to the distant location of the source of the credits. Staff believes that the project will need to provide additional local ozone precursor reductions and PM_{10} emission reductions to mitigate the project impacts to a level of less than significant. Based on actual recorded ambient concentrations of ozone and PM_{10} in Pittsburg (the location of the ERCs), Livermore, and Tracy, staff estimates that additional local emission reductions equal to 15 percent of the project ozone precursor emissions (about 50 TPY) and 32 percent of the project PM_{10} emissions (approximately 47 TPY) are needed to mitigate the project. Staff has derived these percentages by observing the extent to which ambient pollutant concentrations increase from one monitoring station to the next, as the air mass accumulates emissions traveling through the region. Thus, staff requires additional mitigation to account for the percentage of ERCs from the Pittsburg area that has no effect on the Livermore/Tracy area. Conversely, credit is given for the percentage of ERCs in the Pittsburg area that would have a positive effect on the Livermore/Tracy area due to transport.

Possible Mitigation Measures

To reduce the project's PM_{10} and ozone emission impacts, staff has identified several mitigation measures that staff believes are feasible to mitigate the project emission impacts. Staff believes that any proposed mitigation should be obtained within the Tracy/Livermore area; should provide reductions of combustion-related emissions; and if the violations of the ambient air quality standard are seasonal, should be provided during the season in which potential violations occur. These mitigation measures are presented below as options for discussion at the upcoming workshop.

1. Provide four natural gas fueled transit buses [at a cost of $800,000], 48 seats each, to the City of Tracy Regional Transit. These four buses (or equivalent, as agreed upon by staff and applicant) will be used to transport passengers, during rush hours [6:00 AM to 10:00 AM, and 3:00 PM to 7:00 PM], from Tracy, Altamont and Livermore areas to the Bay Area Rapid Transit (BART) station in Livermore. Staff estimates that these two buses will serve approximately 1200 passengers a day during rush hours. Potential emission reductions are based on removing 1200 commuters, and their vehicles, from the local roadways.

2. Provide funding to construct a natural gas refueling station [at a cost of $250,000] to provide the infrastructure for the natural gas buses.

3. Provide two natural gas fueled school buses [at a cost of $300,000], 42 seats each, to Mountain House School District to transport students to and from the schools. One of the buses will be dedicated to serve the students at the Mountain House School. The two new school buses would replace the two existing diesel fueled buses, which are not efficient and emit a significant amount of diesel soot. Replacement of the old diesel buses will reduce the students' exposure to diesel exhaust, which is identified by the Air Resources Board as a carcinogenic compound and toxic air contaminant, and provide emission reductions of criteria pollutants.

4. Provide funding [in installment equivalent to $50,000 a year, for a period of 15 years] to replace the above buses after 15 years of service to assure that the proposed mitigation is in place for a similar timeframe as the power plant.

5. Provide funding to Mountain House School to install solar panels on the roof [at a cost of approximately $25,000]. The solar panels provide an active demonstration to the community of local generation and load reduction.

6. Provide funding to renovate the Mountain House School parking lot to ease congestion traffic during school rush hours [at a cost of $30,000] and/or subsidize fees charged to parents for use of the school bus system. The renovation will reduce fugitive dust emissions and reduce air pollutant emissions by reducing traffic congestion and vehicle idling.

7. Provide funding to build an ultra-low sulfur diesel refueling station to serve construction equipment at the new Mountain House Community [at a cost of $250,000]. If the cost of the refueling station is less than $250,000, any money left over will be used to subsidize the cost of the fuel. The use of diesel fuel meeting

CARB specifications for ultra-low sulfur fuel (reduced aromatics and sulfur) result in tailpipe reductions of sulfur oxides, particulates, unburned hydrocarbons and NO_x.

8. Start a program and provide funding to subsidize the cost of replacement of 540 existing conventional wood stoves with newer EPA Phase II certified units ($1,250 per unit, for a total cost of $675,000). The certified units significantly reduce particulate and unburned hydrocarbon emissions compared to existing units.

The Potential Emission Reductions

For purposes of discussion, staff has estimated the potential emission reductions from some of the measures identified above.

The applicant needs to provide additional 47 TPY of local PM_{10} emission reduction credits to fully mitigate the project PM_{10} emissions. The PM_{10} emission reductions from the conversion of transit buses and school buses to natural gas fuel, and the implementation of low diesel fuel for the Mountain House Community construction, would provide 17 TPY of PM_{10} emission reduction credits. This will reduce the project PM_{10} offsets liability to 31 TPY. Because the PM_{10} violations in the area typically occurs during the four months (October to January), staff recommends that the local offset mitigation requirement only applies to that problem period. Therefore, the remaining PM_{10} project liability is reduced to 10 tons (31TPY*4mos./12 mos.). The total PM_{10} liability for the project is equivalent to 27 tons.

Emission Reductions from Staff Recommended Mitigation Measures
(Tons per Year)

	NO_x	**VOC**	**PM_{10}**
Transit Buses	7.70	9.10	7.0
School Buses	0.50	Neg.	Neg.
Ultra-Low Sulfur Diesel + Oxidation Soot Filter	27.7	Neg.	9.26
Wood Stoves Replacement	Neg.	23.7	10.4
Project's Offsets Liability	39.5	11.1	27[1]
Fully mitigated?	Yes	Yes	Yes

[1] This is the amount of local mitigation that staff recommended.

Detailed Estimation of Emission Reductions

1. Estimated Emission Reductions from Transit Buses:

   Assumptions:

   - Approximately 1200 riders a day will take the transport buses to BART station.
   - Average round trip from Tracy to Livemore is 30 miles.
   - Each passenger will have 5 days/week and 48 weeks/year working schedule.

- San Joaquin Valley fleet wide average car emissions = 0.81 g/mile for NO_x, 0.96 g/mile for VOC, and 0.038 g/mile PM_{10} (Sierra Research).
- Entrained road dust PM_{10} emissions = 0.7g/mile[1].

Emission Reduction Credits:

$$\dot{VOC} = 1{,}200 trips * 30 miles * 5 d/wk * 48 wk/yr * \frac{0.96 g/mile}{453.6 g/lb} = 18{,}290 lbs/year$$

$$\dot{NOx} = 1{,}200 trips * 30 miles * 5 d/wk * 48 wk/yr * \frac{0.81 g/mile}{453.6 g/lb} = 15{,}430 lbs/year$$

$$\dot{PM}10 = 1{,}200 trips * 30 miles * 5 d/wk * 48 wk/yr * \frac{0.738 g/mile}{453.6 g/lb} = 14{,}050 lbs/year$$

2. Estimated Emission Reductions from School Buses

Known data

- Fleet wide average school buses emissions = 0.49 g/mile PM_{10}, 25.01 g/mile NO_x, 1.47 g/mile VOC (Sierra Research).
- Each bus engine would average about 275 hp (assumed by staff)
- Each bus would run approximately 60 miles a day and 200 days per year (assumed by staff)
- Each natural gas bus is expected to emit 50 percent less VOC, 65 percent less NO_x and 95 percent less PM_{10} than the existing diesel school buses.

Calculations:

- PM_{10} emissions reduction from replacement of 2 buses:
$$\dot{PM}10 = 2 buses * 60 miles * 200 d/yr * \frac{0.49 g/mile}{453.6 g/lb} * 0.95 = 24 lbs/year$$
- NO_x emissions reduction from replacement of buses:
$$\dot{NOx} = 2 buses * 60 miles * 200 d/yr * \frac{25 g/mile}{453.6 g/lb} * 0.65 = 860 lbs/year$$
- VOC emissions reduction from replacement of buses:
$$\dot{VOC} = 2 buses * 60 miles * 200 d/yr * \frac{1.47 g/mile}{453.6 g/lb} * 0.50 = 39 lbs/year$$

3. Ultra-Low Sulfur Diesel Fuel and Soot Filter on Construction Equipment

The Mountain House Community Environmental Impact Report (MHCEIR) indicated that it would take approximately 25 years to build the entire housing project. During

[1] Akula Vankatram, Dennis R. Fitz. Measurement and Modeling of PM_{10} and $PM_{2.5}$ Emissions from Paved Roads in California. March 10, 1998.

this time, earth moving equipment, cranes and delivery trucks will be employed. At the current time, there is no requirement that the construction equipment meet any new emission standards adopted by the state or the federal environmental protection agencies. Because the schedule and the exact construction equipment to be used in the construction of the Mountain House Community are not available, staff cannot provide an exact quantity of emission reduction from the implementation of this measure. The following calculations show the potential emission reduction from the implementation of staff's recommended control measure:

Assumptions:

(a) The construction schedule: 8 hrs/day, 6 days/week, and 50 weeks/year
(b) At the construction site, there are:

- 5 delivery/dump trucks, each rated at 400 hp,
- 3 earthmovers, each rated at 300 hp,
- 2 bulldozers, each rated at 250 hp,
- 2 backhoes, each rated 120 hp,
- 1 water truck rated at 250 hp.

(c) Each heavy-duty construction equipment listed above would exhibit 1 g/hp-hr PM_{10} and 9.6 g/hp-hr NO_x emissions (Non-Road Engine and Vehicle Emissions Study-USEPA, 1991).
(d) The NO_x and PM_{10} emissions for construction equipment equipped with post 1996 certified engine and oxidation soot filter are 6.9 and 0.1 g/hp-hr, respectively (ARB Emission Standards).

Calculations:

PM_{10}:

Construction PM_{10} emissions

$$\frac{1g}{hp-hr} * \frac{3{,}890hp}{} * \frac{lbm}{453.6g} * 8hr/d * 6d/wk * 50wk/yr = 20{,}580lbs$$

Effective control efficiency of the oxidation soot filter

$$Eff. = \frac{1-0.1}{1} g/hp-hr = 0.9$$

Emission reductions after control

$$\Delta \dot{E} = 20{,}580lbs * (0.9) = 18{,}520lbs/year$$

NO_x:

Construction NO_x emissions

$$\frac{9.6g}{hp-hr} * \frac{3{,}890hp}{} * \frac{lbm}{453.6g} * 8hr/d * 6d/wk * 50wk/yr = 197{,}590lbs$$

Effective control efficiency of the oxidation soot filter

$$Eff. = \frac{9.6-6.9}{9.6} g/hp-hr = 0.28$$

Emission reductions after control

$$\Delta \dot{E} = 197{,}590lbs * (0.28) = 55{,}325lbs/year$$

4. Wood Stoves Replacement Program

To achieve 10 tons of PM_{10} emission reductions from wood-stove replacement, staff uses the following information and calculation methods.

Known data (reference EPA AP-42, Table 1.10-1):

1. conventional wood stove = 30.6 lb PM_{10}/ton, and 53 lb VOC/ton
2. non-catalytic wood stove phase II certified = 14.6 lb PM_{10}/ton, and 12 lb VOC/ton
3. burn 1.5 cords/year each (Sierra Research)
4. each cord = 1400 kg

Calculations:

- Convert from cord to tonnage of wood:

$$\frac{1.5cords}{yr} * \frac{1400kg}{cord} * \frac{2.205lb}{kg} * \frac{ton}{2000lb} = 2.32\frac{tons}{yr}$$

- Emissions reduction per wood stove conversion:

$$\Delta \dot{E} = (\frac{30.6lbPM_{10}}{ton} - \frac{14.6lbPM_{10}}{ton}) * \frac{2.32ton}{yr} = \frac{37.1lbPM_{10}}{unit * yr}$$

- Numbers of unit needed:

$$\frac{10ton}{yr} * \frac{2000lb}{ton} * \frac{unit}{37lbPM_{10}} = 540units$$